1855MNRAS..15..210M

The star (*a*) is of 10.11 magnitude. Clouds prevented its being observed after the evening of the 3d. The comet does not exhibit any trace of either tail or nucleus. It appeared somewhat fainter than the nebula in *Hercules*.

[This comet is the same as that mentioned in the *Monthly Notices* for May as having been discovered by M. Klinkerfues at Göttingen on the 4th of June. Dr. Donati's discovery is, consequently, a day earlier than that of the latter.—Editor.]

On the Values of the Constants of Nutation and Aberration, and of the Parallax of γ Draconis, as Deduced from the Observations made with the Twenty-five Foot Zenith Tube, at the Royal Observatory, Greenwich. By the Rev. R. Main.

The observations discussed in this Paper extend from June 1837 to May 1848, during which time they were made with tolerable continuity, the only interruptions being such as were inevitable either on account of periods of bad weather, or from the difficulty of seeing the star in the day-time, or from occasional readjustments or alterations in the instrument.

The author commences with a preliminary recapitulation of the principal results obtained by preceding astronomers for the values of aberration and nutation. He next gives a description of the instrument employed in the observations which form the groundwork of his own investigation, referring for further details to the Introduction of the *Greenwich Observations* for 1837 and subsequent volumes.

The zenith tube was erected by Troughton during the Directorship of Pond for the purpose of observing several stars in addition to *Polaris*, which pass the meridian of Greenwich very near the zenith, but no regular series of observations suitable for any delicate inquiry was made with it till the accession of Mr. Airy. One of the first points taken into consideration by the latter astronomer was the examination and improvement of this instrument, with the view of rendering it efficient for making an extensive series of observations of *γ Draconis*.

It may be mentioned, for the sake of showing the fineness of the micrometer-screw, that the value of a revolution was found from the mean of several determinations made in the winter of 1836 and agreeing very closely with each other to be $6''\cdot714$; a similar determination in the spring of 1846 gave $6''\cdot724$ for the value of a revolution.

After describing the various precautions which were taken to prevent any disturbing influence from vitiating the observations, the author next proceeds to explain the processes pursued in the calculations.

1855MNRAS..15..210M

First, the observations were divided into convenient groups, rarely extending over an interval of time greater than fourteen days; and it is assumed that for these intervals the mean of the observed apparent zenith distances corresponds accurately to the mean of the days of observation. This supposition is sufficiently accurate even with reference to the changes of the coefficients of aberration and parallax.

The author thus obtains a series of normal apparent zenith distances which theoretically ought to be very accurate, and each of which may be represented by an expression containing the following terms:—

1. The assumed mean north zenith distance for an assumed epoch.
2. The correction due for precession and proper motion for the interval of time comprised between the epoch and the day corresponding to the mean of each group of observed zenith distances.
3. The correction for aberration.
4. The correction for parallax.
5. The correction for nutation.

The assumed epoch is 1840, January 1, and the assumed north zenith distance for that epoch is $118''\cdot 00 + v$, the latter quantity representing a correction, the value of which is to be determined from the investigation.

For the precession the assumed value of n is that given by M. Peters in his *Numerus Constans Nutationis* for 1840, namely, $20''\cdot 057$; and the assumed proper motion is that deduced by the author himself in his paper on the "Proper Motion of the Fixed Stars." (*Mem. R. Ast. Soc.*, vol. xix.) These, when combined, give $-0''\cdot 66$ for the annual variation in north zenith distance. For convenience of application a table is made of the amount of this correction for every hundred days.

The constant of aberration is assumed to be $20'' + x$, and the constant of parallax is represented by y, x and y being unknown corrections.

The constant for nutation is assumed to be for 1840: $9''\cdot 223 \left(1 + \frac{z}{10}\right)$, z being an unknown quantity, which, in like manner as v, x, y, is to be determined from the investigation.

The mean zenith distance corresponding to a group after receiving the various corrections above-mentioned computed for the mean date of the group, is compared with the observed zenith distance, and an equation of condition is thus formed, involving besides the three unknown quantities, x, y, z, a constant and unknown correction to the mean zenith distance denoted by v. A comparison of the computed with the observed normal apparent zenith distance for each group furnishes one of such equations, and thus a series of equations of condition are obtained, from which the values of the unknown quantities v, x, y, z, are to be determined.

1855MNRAS..15..210M

The total number of equations of condition is 161. Treating them by the method of least squares, the author obtains the following results:—

$v = -0''{\cdot}173$; weight 528·007; prob. error 0·047
$x = +0{\cdot}058$; weight 240·192; prob. error 0·071
$y = -0{\cdot}378$; weight 266·231; prob. error 0·067
$z = +0{\cdot}118$; weight 289·281; prob. error 0·064

Hence, as the assumed mean distance for 1840, January 1, was 118″·00; the constant of aberration $20'' + x$; and the constant of nutation for 1840, $9''{\cdot}224\left(1 + \frac{z}{10}\right)$, we have finally,—

Mean Zenith Distance North of *γ Draconis* for 1840, January 1 =	117″·827 ± 0″·047
Constant of Aberration	20·058 ± 0·071
Constant of Lunar Nutation	9·335 ± 0·067
Constant of Parallax	−0·378 ± 0·067

The author concludes with the following remarks:—

"The anomalous results here indicated for the aberration and the parallax seem to show that some cause of error of a periodical character has acted injuriously on the observations; but it is very difficult to imagine a source of error of this nature. A want of fixity of the object-glass, or of the grand micrometer, or of the plumb-line microscopes, would have exhibited itself in producing inconstancy in the zero, and sudden irregularities in the observations; but, on the whole, the zero has, through the whole series of the observations, all desirable steadiness, and the observations are as consistent with each other as could be expected. The value of a revolution of the grand micrometer was determined by an exceedingly accurate method, twice in the interval of a few years, and the two results were almost identical. One determination was made in the winter of 1836, and the other in the spring of 1846; and it is probable that the average temperature was pretty nearly the same at each determination; but, even if the result be affected with an unknown temperature correction, the range of arc required for observations of *γ Draconis* is so small, that no significant error is to be apprehended on this account. The only remaining supposition is that of some derangement or deflection of the plumb-line, and the chance of any disturbance of such magnitude and constancy as the case requires having happened, appears to be very small. If the plumb-line should have been pulled out of the vertical by means of the auxiliary apparatus added in 1840 for the prevention of the twist caused by rapid rotation of the instrument, the deviation would be totally in the prime vertical, and the projection on the meridian plane would still be accurately vertical. It may be added also, that any deviation of the plumb-line from the vertical would be eliminated by the double observation in reversed positions.

1855MNRAS..15..213C

"Still, it is believed that, notwithstanding the doubt which, to a certain extent, seems to rest on the results of the investigation, on account of the anomalous values deduced for the aberration and the parallax, considerable weight may still be attached to the value deduced for the nutation-constant, since, on the supposition of an unknown cause of error producing an inequality, having either an annual or a shorter period, its effect would be perfectly eliminated in so long a series of observations.

"The labour bestowed upon the investigation in the endeavour to produce the best possible result from the observations by applying rigorously the method of least squares, has been very great; and, as the whole of the calculations have been performed by myself, I regret much that the results have not proved so unexceptionable as to warrant the amount of care and labour expended. Still, a laborious work of this kind cannot be without its value; and it is hoped that additional scrutiny may afterwards throw some light upon the nature of the errors in the results of an investigation based upon observations made in an unexceptionable way, with an instrument faultless in theory, and pursued by processes combining all the modern refinements.

"For the present I leave this Paper in the hands of astronomers, with the hope that some one interested in the subject may be able to offer some elucidation of the difficulty thus presented.

"1855, *May* 30."

Results of Astronomical Observations made at the Observatory of the University, Durham, from October 1849 *to April* 1852, *under the general direction of the Rev. Temple Chevallier, B.D., F.R.A.S., Professor of Mathematics and Astronomy.* By R. C. Carrington, Esq., B.A., F.R.A.S., Observer in the University. 8vo. Durham, 1855.

In an Introduction, embracing sixteen pages, the author gives a description of the instruments and mode of observation pursued.

From October 1849 to the beginning of May 1850, the observations were almost exclusively meridional; thenceforward, with little exception, equatoreal. The objects observed in the meridian during 1849 and the spring of 1850 were, for the most part, stars from the Catalogue of the British Association, of which modern observations were wanted, the moon and moon-culminating stars, and the planets *Mars*, *Jupiter*, *Saturn*, *Uranus*, and *Neptune*. After April 1850, the objects were mainly such of the comparison stars used for the equatoreal as were not too faint for the transit telescope. The objects observed with the equatoreal were the planets *Pallas*, *Juno*, *Hebe*, *Iris*, *Flora*, *Metis*, *Hygeia*, *Parthenope*, *Victoria*, *Egeria*, *Irene*, and *Eunomia;* and the comets called Petersen's third, Bond's, D'Arrest's, Brorsen's fourth, and Encke's.